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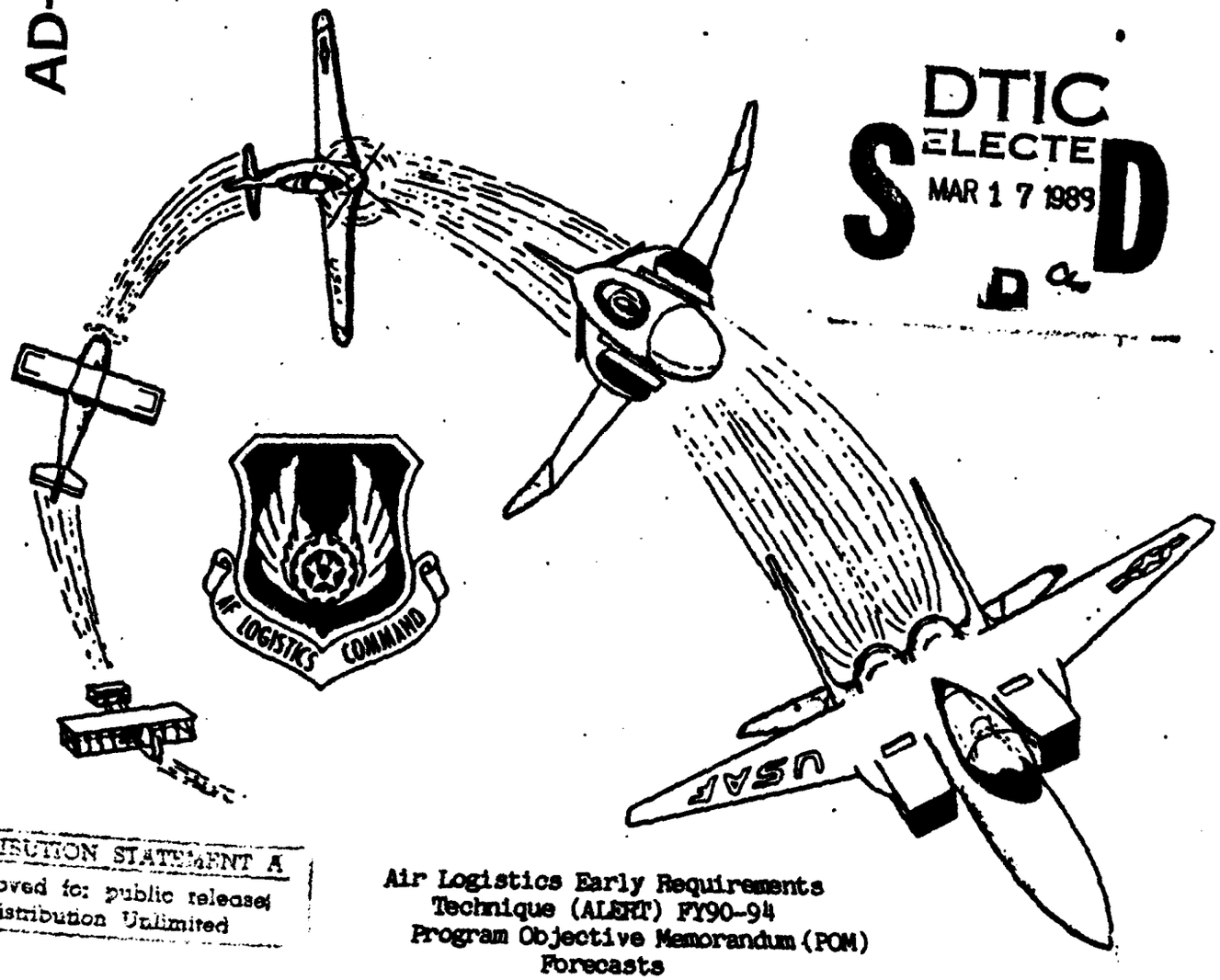
AIR FORCE LOGISTICS COMMAND

MATERIEL ANALYSIS



Air Logistics Early Requirements Technique (ALERT) FY90-94 Program Objective Memorandum (POM) Forecasts

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Jan 89

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

1. The Air Logistics Early Requirements Technique (ALERT) is the Air Force approved method for forecasting the Peacetime Operating Stock (POS) segment of the aircraft replenishment spares (BP15) Program Objective Memorandum (POM) forecasts.

2. The budget program managers used ALERT to develop the FY90 through FY94 BP15 POS POM forecasts.

3. The Central Secondary Inventory Stratification (CSIS) historical data used as input to ALERT contains errors, which requires adjustments to the ALERT forecasts.

4. The budget program managers question using the value of the fleet data as an input to ALERT.

ACTIONS

1. Continue to document the annual ALERT forecasts. (OPR: HQ AFLC/MMMA and MMMI)

2. Continue to identify weakness of the ALERT and POM forecasting techniques and develop ways to improve the process. (OPR: HQ AFLC/MMMA and MMMI)

3. Improve the CSIS data base. (OPR: HQ AFLC/MMM)

4. Analyze the impact the value of the fleet has on POM forecasts and identify improvements as necessary. (OPR: HQ AFLC/MMMI and ACC OCR: HQ AFLC/MMMA)

ABSTRACT

This report documents the 1987 application of the Air Logistics Early Requirements Technique (ALERT) for estimating the FY90-FY94 Program Objective Memorandum (POM) inputs for the Peacetime Operation Spares portion of the aircraft replenishment spares budget (BP15). This is the fifth consecutive year that ALERT has been used to prepare ~~AFLC~~ POM inputs to the Air Staff. ALERT's logic is a combination of statistical forecasts and management adjustments to these forecasts which yield the Command's total peacetime operating stock requirement for the Program Objective Memorandum (POM) period.

EXECUTIVE SUMMARY

Since 1984, Headquarters Air Force Logistics Command (AFLC) has used the ALERT model to project the BP15 aircraft peacetime spares Program Objective Memorandum (POM) requirement. ALERT performs a statistical analysis of historical data to forecast the BP15 primary operating stock (POS) requirement by weapon system. The HQ AFLC BP15 budget program managers review the statistical projections and make final adjustments. ALERT is the only BP15 POM forecasting approach sanctioned by the Air Staff. This report documents the development of the FY90-94 POM forecasts. The following table shows the ALERT estimates for the total BP15 budget for the FY90-FY94 POM.

FY90	FY91	FY92	FY93	FY94
$2600.2M	$2407.0M	$2479.5M	$2551.2M	$2741.2M

ALERT uses 16 individual weapon system regression equations to develop each fiscal year's BP15 estimate by weapon system and an Air Force total. These, individual forecasts are then added together to develop the Air Force total BP15 POM forecast.

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CHAPTER 1

THE PROBLEM

Due to a lapse of from three to seven years between projection and initiation of fund requirements in the Program Objective Memorandum (POM) and budget process, the Air Force needs a long range forecasting technique to project outyear requirements. HQ AFLC uses the Air Logistics Early Requirements Technique (ALERT) to project POM requirements. We document the results of the ALERT projects for FY90-FY94 in this report.

Background

ALERT has been used to prepare the AFLC POM input for Peacetime Operating Spares (POS) since 1984 when it was used to prepare inputs for the FY86-FY90 POM. The ALERT projections serve as the AFLC financial management staff's starting point in preparation of the POM input. We say starting point because the financial management staff adjusts the ALERT results based on other information not easily incorporated in a statistical forecast in order to arrive at the final proposed POM input.

Each year, the AFLC Directorate of Materiel Requirements and Financial Management (MMM) develops POM submissions for many budget programs. **For POS segment aircraft replenishment spares (BP15), the Air Staff has directed we use the ALERT model to develop these forecasts. Since 1984, ALERT has been the Air Staff-approved method.** This year, analysts from the Directorate of Materiel Requirements validated the FY87 POM spares forecast which ALERT projected in 1984. The results of this validation effort are presented in another report [2].

Objectives

1. To document the ALERT forecasts for the aircraft replenishment spares requirements input for the USAF FY90-FY94 POM.

2. To identify areas to improve future ALERT forecasts.

CHAPTER 2

ANALYSIS

We document the development of the FY90 to 94 POM forecast in three sections. First we describe the ALERT model. In the second section we discuss the results for the FY90 to FY94 forecasts. In the final section, we discuss issues.

MODEL DESCRIPTION

In this section we briefly describe the ALERT model. Although AFLC has used ALERT for the past five years there has been very little documentation on ALERT. For a macro view of POM forecasting models, recommend reading [1]. Appendix A documents a January 1984 working paper on ALERT. **We will continue to document the annual ALERT forecasts.**

ALERT is a regression based model that uses historical data to predict future POM requirements by weapon system and a total Air Force requirement. ALERT predicts the Peacetime Operating Stock, BP15 requirements using 25 historical (independent) variables. Appendix B provides a complete list of the variables.

The ALERT methodology uses ten years of historical weapon system data. Each of the ten years includes the following:

a. Past POM submissions for the BP15 POS.

b. The sum of the Central and Secondary Item Stratification (CSIS) extended year total buy requirement plus the CSIS Approved Force Acquisition Objective (AFAO) buy requirement for condemnations only (this is an estimate of recoverable buy requirements three to four years from the current June computation).

c. The reciprocal of the estimated present age of the fleet (developed by USAF/AC).

d. Dollar value of the fleet (developed by USAF/AC).

ALERT is actually a five step process.

Step 1, Update the Data Base - The first step is to collect the most up-to-date data on each of the variables. This includes updating Central Secondary Item Stratification (CSIS) data and the age and value of the fleet data and entering them into an automated data base.

Step 2, Develop Regression Equations - This step involves running the regressions and selecting the equations that result in the best fit of the data. Each weapon system has its own regression equation with its own set of independent variables. Appendix C provides the best set of regression equations for FY90 and FY91 through FY94. We develop a different set of equations for FY91 through FY94, because these forecasts include the FY90 forecasts as historical data. (Using a regression forecasts as another data point in developing yet other forecasts is a statistical technique called bootstrapping).

Step 3, Management Review - The results of Step 2 reflect the best set of regression equations and forecasts based on historical data. However, historical data is not always the best prediction of the future, because it assumes what happens in the past will continue in the future. Therefore we include a management scrub which provides management a chance to look at the results and identify any known occurrence that would impact the future. In addition, there are continuous adjustments and corrections made to historical CSIS data that are not included in our data base. These updates and corrections are identified and input into the data base during the management scrub.

Step 4, Develop New Regression Equations - Basically we repeat Step 2 with the updated data and include indicator or "dummy" variables to reflect future known occurrences. For example, if the budget program managers know of a significant modification or program change, we adjust the regression equation to account for the change.

Step 5, Present the ALERT Forecasts - We then present the ALERT forecasts by weapon system and total BP15 requirements to the budget program manager.

RESULTS

We generated FY90 regression forecasts for management approval by the Budget Program (BP) manager. Table 2-1 shows the forecast results (Step 2) of the weapon system specific regression equations for FY90. The sum of these estimates is the FY90 BP15 POM baseline. Table 2-1 also shows the adjusted R-squared values which measure the amount of variation explained by the regression equation. A number closer to 1 means a better forecast, that is the regression equation reduces most of the forecast error.

	REGRESSION RESULTS	
WEAPON SYSTEM	**ADJUSTED R-SQUARED**	**FY90 FORECAST (IN $M)**
A-7	.75	17.7
A-10	.63	31.1
B-1	.23	327.4
B-52	.68	72.4
C-5	.66	138.8
C-130	.13	95.6
C-135	.70	160.8
C-141	.39	26.9
E-3	.65	25.5
F-4	.70	24.3
F-15	.13	131.5
F-16	.96	157.2
F-100	.75	673.5
F-111	.66	160.4
COMMON	.73	351.4
OTHER	.54	234.7
TOTAL		2629.2

TABLE 2-1

Once the budget program manager approves this aggregate value, the FY90 POM forecast is added to the data history and used to estimate the FY91-FY94 POM forecasts. This process is known as bootstrapping. The total buy value from the CSIS is not used in the outyear forecasts as an independent variable because no CSIS data is available for the POM outyears. Only value of the fleet, the reciprocal of the age of the fleet, the year of the data, and indicator variables are inputs to the regression equations. Table 2-2 shows the ALERT weapon system-specific forecasts for FY90-FY94 (in $ millions).

PRE-SCRUBBED
ALERT REGRESSION EQUATION RESULTS
(FY90 through FY94)

WEAPON SYSTEM	FY90	FY91	FY92	FY93	FY94
A-7	17.7	16.5	15.8	12.9	9.1
A-10	31.1	20.7	16.5	12.3	8.1
B-52	72.4	24.4	15.6	15.6	15.6
C-5	138.8	151.6	151.7	151.8	151.9
C-130	95.6	63.7	64.5	60.6	60.3
C-135	160.8	178.9	192.5	206.2	219.9
C-141	26.9	28.7	28.7	28.7	28.7
E-3	25.5	26.4	25.7	25.8	25.7
COMMON	351.4	297.9	297.9	297.9	297.9
F-4	24.3	6.8	3.7	1.6	2.1
F-15	131.5	139.8	130.2	121.7	112.9
F-16	157.2	172.3	188.3	204	216.5
F-100	673.5	719.8	766.9	814.1	861.4
F-111	160.4	163.9	161.3	158.5	155.6
OTHER	234.7	275.8	293.5	309	346.5
B-1	327.4	321.9	326.7	331.5	336.4
TOTAL	2629.2	2609.1	2679.5	2752.2	2848.6

TABLE 2-2

Budget Program Manager's Scrub

Long range forecasting is an art not a science. Regression, as would any strictly quantitative technique, can not replace human judgement nor accurately predict qualitative factors. Therefore, in Step 3 we "scrub" the forecasts to ensure the input data is correct and up-to-date and that all known future events are considered. For the FY90 through FY94 forecasts, there were several factors that needed updating. For example, due to a congressional decision the BP manager had to subtract expected buys of electronic countermeasures (ECM) items from the B-1 estimates. For all years FY90-94, BP managers allocated the ALERT Common requirements across weapon systems, including weapon systems not explicitly forecasted by ALERT. The FY90 ALERT values by weapon system were compared against the FY89 POM to compute a rate of change factor. The FY91-FY94 forecasts were recomputed by BP managers using this factor. Table 2-3 reflects the final ALERT regression results.

FINAL ALERT FORECASTS

($ IN MILLIONS)

	FY90	FY91	FY92	FY93	FY94
A007	25.3	25.3	23.1	22.8	23.6
A010	45.2	47.1	46.9	47.5	49.2
B01B	373.7	96.5	99.4	102.0	105.6
B052	153.2	169.1	172.4	186.1	192.7
B111	17.6	18.2	18.6	19.1	19.8
E111	11.9	12.0	12.3	12.7	13.2
F111	154.0	164.2	159.8	160.7	166.4
C005	93.1	84.3	76.9	70.3	72.8
C017	18.9	36.7	63.8	67.8	70.2
C130	132.3	132.7	136.4	141.4	146.4
C135	156.9	167.2	175.1	184.6	191.1
C141	68.4	73.3	74.0	76.7	79.4
E003	29.8	28.5	27.0	25.5	26.4
E004	2.4	2.9	2.9	2.9	3.0
F004	79.8	59.5	56.5	45.2	46.8
F005	21.4	24.6	25.5	25.6	26.5
F015	397.7	428.6	434.7	463.1	479.4
F016	574.1	549.3	598.6	646.8	669.6
H001	1.2	1.4	1.3	1.3	1.4
H003	2.5	2.9	2.9	3.0	3.1
H053	17.2	17.4	17.9	18.5	19.2
H060	.5	.5	.5	.5	.5
OTHR	164.8	204.4	190.9	163.2	168.9
T037	13.7	14.5	14.8	15.2	15.7
T038	43.8	45.2	46.5	47.7	49.4
T039	.8	.9	.9	1.0	1.0
TOTAL	2600.2	2407.0	2479.5	2551.2	2641.2

TABLE 2-3

The budget program managers used these values to develop the FY90 through FY94 BP15 POS POM forecasts.

ISSUES

The budget program manager identified two issues while developing the FY90 through FY94 ALERT forecasts. **First, ALERT input data from the CSIS is of questionable accuracy and needs to be improved.** The budget program manager acknowledges this. In particular, buy requirements used for the FY90 regression forecast come from the June cycle of the CSIS and BP manager judges the June cycle to be the most inaccurate of any of the four annual CSIS cycles in the past. The primary reason for this inaccuracy is the lack of data base file maintenance. As a result of June data base inaccuracies, key ALERT inputs could be in error. The BP manager expects that the Requirements Data Bank (RDB) improvements to the recoverables CSIS (ie. CSIS Restratification) will eventually provide more accurate June cycle inputs to ALERT. This improvement, however, is itself likely to cause a shift in the historical trend of the data, and the model logic will require minor changes to allow for the effect of the "cleaner" data inputs.

The second issue concerns the value of the fleet data. The value of the fleet entered significantly into virtually all of the regression equations used to develop the ALERT POM submission estimates. However, the computed value of the fleet decreased over time for most weapon systems because USAF/AC's estimate for this variable was a function of future flying hour programs. Most weapon systems supported by BP15 have decreasing projected flying hour programs. **The BP manager criticizes this aspect of ALERT.** Since the value of the fleet decreases over time, older weapon system fleets will undergo more modifications and require more spares support which will not be reflected in flying hour trends. A new means of estimating the fleet must be investigated for future ALERT runs, or, perhaps, we should no longer use the value of the fleet as a predictive variable. **We need to analyze the impact the value of the fleet data has on POM forecasts and identify improvements as necessary.** In addition to this, **we need to continue to identify weaknesses of the ALERT and POM forecasting techniques and develop ways to improve the process.**

CHAPTER 3

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

1. The Air Logistics Early Requirements Technique (ALERT) is the Air Force approved method for forecasting the Peacetime Operating Stock (POS) segment of the aircraft replenishment spares (BP15) Program Objective Memorandum (POM) forecasts.

2. The budget program managers used ALERT to develop the FY90 through FY94 BP15 POS POM forecasts.

3. The Central Secondary Inventory Stratification (CSIS) historical data used as input to ALERT contains errors, which requires adjustments to the ALERT forecasts.

4. The budget program managers question using the value of the fleet data as an input to ALERT.

ACTIONS

1. Continue to document the annual ALERT forecasts. (OPR: HQ AFLC/MMMA and MMMI)

2. Continue to identify weakness of the ALERT and POM forecasting techniques and develop ways to improve the process. (OPR: HQ AFLC/MMMA and MMMI)

3. Improve the CSIS data base. (OPR: HQ AFLC/MMM)

4. Analyze the impact the value of the fleet has on POM forecasts and identify improvements as necessary. (OPR: HQ AFLC/MMMI and ACC OCR: HQ AFLC/MMMA)

APPENDIX A

A STUDY OF POM FORECASTING FOR AIRCRAFT RECOVERABLE ITEMS

Prepared by

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January 1984

"FORECASTING POM RECOVERABLE ITEM REQUIREMENTS"

1. Objective of Study: Develop a Long-Range Forecasting Technique to Project POS Aircraft Replenishment Spares Requirements for the Program Objective Memorandum (POM)

2. Background: The Air Force Logistics Command (AFLC) is responsible for forecasting POM aircraft recoverable spares requirements at the weapon system level. The Air Staff reviews and approves these forecasts which are then used in the Air Force POM. For budgeting, item-by-item computations are done in the D041 (Recoverable Consumption Item Requirements System) using over twenty factors, including demand rates, repair rates, condemnation rates, etc. These computations are then adjusted for known file maintenance changes, and transformed into a Budget Estimate Submission (BES) each September. Approximately two years elapsed between the BES submission to initiation of funds (i.e., the FY85 BES was submitted in September 1983). For the POM years no item-by-item computation has traditionally been used. Instead, a cost-per-flying-hour rate, based upon BES requirements, has been used to forecast POM requirements. In recent years the forecasts have tended to understate the final requirements. For example, the final requirements for aircraft recoverable items for the five years FY78-82 was understated. We experienced an average growth of 92% between last POM submission and final funds requirements (derived from the Corona Require study, March 1983). This spawned a series of studies to determine why, and to recommend improved POM forecasting methods. The prime project initiated by the Air Force in October 1982, "Corona Require", assigned HQ AFLC/MMM the responsibility of improving POM forecasting for recoverable items in April 1983. An independent effort, by USAF/ACM, assisted with data from USAF/LEX/PRP developed a macro forecasting technique based upon aircraft specific exogenous prediction variables, in January 1983 which was used to project the FY85 POM. AFLC/MMM subsequently developed a macro-forecasting technique which projects actual D041 computed requirements through the BES and first POM years. The last four years of the POM are then forecasted using exogenous variables. The following is a report on the methodology and findings of the AFLC model, ALERT (Air Logistics Early Requirements Technique).

3. Study Methodology:

a. Defined the Problem: Due to a lapse of from three to seven years between projection and initiation of funds requirements in the POM process, a long range forecasting technique is required to project outyear requirements.

b. Selected a Forecasting Technique: Review of the existing state-of-the-art forecasting technology revealed that a number of techniques are available for near-term time periods (e.g. moving averages/exponential smoothing, Box Jenkins - ARIMA, regression, Markov chains, etc.) However, for time horizons beyond eighteen months, accuracy of forecasts are not improved with complex models. Therefore, for the time period of interest in this problem, two-seven years, step-wise linear regression was chosen. The earlier USAF/ACM study has also used linear regression.

c. Developed of Data Base: Data to be analyzed were collected from:

(1) AFLC Budget submissions for the years FY78-83 for aircraft Recoverable Spares (BP1500)

(2) D041 Central Secondary Item Stratification (CSIS) summaries for the years 1977-1983.

(3) Budget Submissions for Modifications (BP1100) and Initial Spares (BP1600) for 1977-1982.

(4) Aircraft specific exogenous variables of MD fleet age, fleet value, and utilization rates from USAF/ACM study.

(5) Peace flying programs used for D041 for respective years for USAF, PA Documents.

(6) Wartime Flying Programs (unclassified version), published by HQ AFLC/XRP for respective D041 requirements years.

(7) OSD and AFLC inflation indices.

(8) SPSS "Statistical Package for the Social Sciences," resident on the HQ AFLC CREATE computer system, WPAFB OH, is the statistical package used to perform the step-wise linear regression and develop predicition equations.

d. Defined the use of Data: Basically, the computed D041 POS requirement is used as the prime predictor variable through the first POM year. An additional "enhancer" variable is selected from eighteen potential predictors, based upon the most statistically significant performance. Exogenous variables were used for the last four years of the POM. Prediction equations representing the historical relationship of these two predictor variables are developed for each M/D. See Appendix B for a list of variables used.

4. Assumptions of Study:

a. The 1978-1983 statement of budget requirements for the AY year (e.g., the statement of the FY83 requirement in the FY85 BES), represents the most refined statement of the final requirement for each respective year. This statement is also referred to as the "last statement", and the "sixth statement".

b. The 1977-1983 D041 products were computed using basically the same methodology for each M/D or adjustment to policy were identified and made. Data prior to 1977 was not used due to a major policy change from a fixed to a variable safety level beginning with the March 1977 computation.

c. The summary of the D041 item-by-item computation of the buy requirement provides valuable information relating to the final requirement at the M/D level, and represents the most likely predictor for eventual requirements. Due to dynamics, over time, this computation is subject to change. One of the objectives of the ALERT model is to capture the direction and strength of these changes.

d. That a programmatic and/or exogenous indicator, as fleet age, value, funding, utilization rates, etc., when statistically selected as an "enhancer" variable, will maintain historical relationship into to forecasted future.

e. That external influences, as the economy and inflation rate can influence purchase requirements.

f. That macro variables as an "enhancer" will maintain their historical relationship, and that they represent a group indicator which may also be an M/D level indicator (a statistical phenomenon often referred to as "Steins Paradox"). (NOTE: Refer to Efron, Bradley, and Morris, Carl, "Steins Paradox in Statistics", Scientific American, 236 (May 1977), 119-127.)

5. FACTS: (All costs in then-year dollars).

a. From 1978-1983 the gross D041 requirement for aircraft recoverable spare item has increased at an exponential rate from a computed gross requirement of $25.6 billion to $49.6 billion.

b. During this period significant internal dynamics occured. Among these were: introduction of the F15/F16 aircraft, the most expensive and highly sophisticated new aircraft ever; the major conversion of strategic cargo aircraft to a 120 day war requirement along with major changes within the logistics support concept of the C5 engine (i.e., TF-39 engine A to 1C conversion); upgrade of strategic bomber and KC 135 parts support (PACER GRADE): the impact of more realistic war factors (PACER PREPARE) for all M/D's; and Defense Guidance to begin orientation of logistics support toward an end item aircraft availability goal; among others. This was further influenced by external dynamics such as the impact of the deepest economic recession since the Greate Depression.

c. Purchase of aircraft spare parts is a source of last resource. D041 computes deficit or buy requirements "after" satisfying spares needs with available assets subject to repair. As a result, purchase requirements are subject to large percentage change, given smaller gross requirement changes.

d. During the historical period, the share of the business for spare parts purchase requirements climbed from 6.5% to 12.1% of the total dollar requirements.

e. As pointed out in the USAF/ACM study, the average age, ownership value, and flying programs have all been increasing.

f. The average age of the price structure resident within D041 large actual prices by some degree, perhaps as much as 5-7 years on the average.

7. DISCUSSION:

a. An interrelated and interdependent set of reasons cause the dynamics experienced between POM submission and eventual dollar requirements at funds initiation, three to seven year hence. An initial effort, in the USAF/ACM regression study, using a model named POSSEM (Peacetime Operating Stocks Spares Estimating Model), indicated that relatively strong relationships exist between

the variables of "fleet age" (implying a "bath tub" curve - that is, younger and older aircraft end to require more support costs than middle aged fleets), fleet value (implying more expensive fleets and more expensive to maintain), and "utilization rates" (implying more use requires more support costs). In this study, these variables were tested and found to have moderately high relationships (i.e. the Average $R = .85$ on the samples we observed). However, when introducing the ALERT technique of D041 computed requirements, the relationships improved significantly (i.e. average $R = .97$ with two predictor variables). Also, this technique is more useful for investigating rapid changes in factors, since it cues from the actual D041 computation.

APPENDIX B

ALERT LIST OF VARIABLES

ALERT

LIST OF VARIABLES

BP1500 MODEL

NAME	DESCRIPTION	CURRENTLY USED
DEPENDENT:		
POSBES	M/D Actual Peace Budget Estimate Submission at (BES) last statement	Yes
WBBES	M/D Actual WRSK/BLSS BES at last statement	No
OWRMBES	M/D Actual OWRM BES at last statement	No
INDEPENDENT:		
TREQ	M/D Gross Reequirement (D041)	No
TBUY	M/D Buy Requirement (D041)	Yes
ORDER	M/D On-Order (D041)	No
DEF	M/D Deficit (D041) (AY & BY)	Yes
WB	M/D WRSK/BLSS (D041)	No
OWRM	M/D OWRM (D041)	No
PCT	M/D Historical Funding, lagged one year	No
AGE	M/D Average Fleet Age	No
VALUE	M/D Average Fleet Value	Yes
FHP	M/D Peace Flying Program, current year	No
MODS	M/D BP1100 modification history	No
BP1o	M/D Initial Spares History	No
INDEX	AFLC Cost Vriation Index (CV1)	No
CUM	The CV1 compounded (base year 1978)	No
WFP	War Flying Program (lagged two years)	No
PAFHP	Peace Flying Program (Unclassified version)	No
MAC REQ	Total Gross Requirement - all categories (D041)	No
MAC BUY	Total Buy - all categories (D041)	No
MACORD	Total On-Order - all categories (D041)	No
MACDEF	Total Deficit - all categories (D041)	No
MAC WP	Total WRSK/BLSS - all categories (D041)	No
MAC OWRM	Total OWRM - all categories (D041)	No
MACPCT	Total Percent Funded, lagged one year (D041)	No
AGEREC	One-Over-Age of Fleet, by M/D	Yes
YEAR	Chronological Year	Yes

NOTE: The variables listed as not currently used have been dropped since 1985 and no longer exist in the historical data base.

APPENDIX C

ALERT REGRESSION EQUATIONS

APPENDIX C

11-5-87

TABLE OF ALERT DIAGNOSTICS (FY90)

MEN/SYS	ADJUSTED R2	EQUATION	FORECAST	DURBIN-WATSON	F-TEST	SIGNIFICANT F
A7	0.74588	[illegible] = (18.7) + (-.000011)(TBUY)	17.7	1.49470	17.14295	0.0009
A10	0.62861	[illegible] = (32.5) + (-.0000041)(TBUY)	31.1	2.28654	7.20614	0.0116
B1	0.23056	[illegible] = (59.2) + (.00820)(VALUE)	327.4	1.99738	2.79524	0.1554
B52	0.68183	[illegible] = (58.3) + (.000016)(TBUY)	72.4	1.33951	12.78646	0.0023
C5	0.65770	[illegible] = (40.1) + (.000089)(TBUY)	138.8	2.23688	11.56795	0.0033
C130	0.12936	[illegible] = (47.0) + (.000124)(TBUY)	95.6	2.38714	2.63434	0.1356
C135	0.69856	[illegible] = (-1024.1) + (.0000091)(TBUY) + (13.1)(YEAR)	160.8	1.96959	13.74566	0.0018
C141	0.38596	[illegible] = (20.6) + (-.000037)(TBUY) + (.00792)(VALUE)	26.9	1.76029	3.30468	0.0783
COMMON	0.73079	[illegible] = (242.6) + (.000043)(TBUY)	351.4	1.50055	15.93029	0.0011
E3	0.64857	[illegible] = (37.7) + (-.000054)(TBUY)	25.5	1.83634	11.15038	0.0037
E4	0.6958	[illegible] = (-51.6) + (.000032)(TBUY) + (.00707)(VALUE)	24.3	1.87615	9.54761	0.0051
F15	0.13089	[illegible] = (141.9) + (-.000011)(TBUY)	131.5	1.44420	1.8283	0.2156
F16	0.95605	[illegible] = (19.1) + (-.00000038)(TBUY) + (.0089)(VALUE)	157.2	1.46416	82.31311	0
F100	0.75123	[illegible] = (-3535.7) + (.000012)(TBUY) + (46.6)(YEAR)	673.5	2.06829	14.62578	0.0032
E111	0.66194	[illegible] = (-68.5) + (-.000023)(TBUY) + (.01872)(VALUE)	160.4	2.44411	8.17958	0.0081
OTHER	0.53876	[illegible] = (-1149.3) + (-.000014)(TBUY) + (15.7)(YEAR)	234.7	1.54026	7.42449	0.0125

Atch 1

11-9-87

TABLE OF ALERT DIAGNOSTICS (FY91-94)

MFR/SYS	ADJUSTED R2	EQUATION	FORECAST	DURBIN-WATSON	F-TEST	SIGNIFICANT F
A7	0.76706	FOSBES = (6.2) + (.00409)(VALUE)	16.5	1.55773	20.75771	0.0003
A10	0.74131	FOSBES = (319) + (.01304)(VALUE) + (-3.9)(YEAR)	20.7	2.95150	12.46276	0.0015
B1	0.20054	FOSBES = (125.3) + (.00587)(VALUE)	321.9	2.12222	1.87797	0.2464
B52	0.76973	FOSBES = (-41.6) + (.00665)(VALUE)	24.4	1.33956	21.05634	0.0003
C5	0.62961	FOSBES = (-44.7) + (.01329)(VALUE)	151.6	2.12161	7.02380	0.0045
C130	0.46665	FOSBES = (-64.3) + (.01489)(VALUE)	63.7	1.30677	6.24957	0.0173
C135	0.79653	FOSBES = (1065.6) + (-.000135)(VALUE) + (13.7)(YEAR)	178.8	2.26196	16.65876	0.0005
C141	0.44619	FOSBES = (-9.3) + (.00561)(VALUE)	28.7	1.71475	5.83413	0.0209
COMMON	0.72491	FOSBES = (297.9)	297.9	1.38074	32.6215	0.0001
E3	0.76788	FOSBES = (50.1) + (-.00722)(VALUE)	26.4	2.68093	20.84832	0.0003
F4	0.74561	FOSBES = (-29.2) + (.00666)(VALUE)	6.8	1.57367	18.58566	0.0004
F15	0.45443	FOSBES = (481.2) + (-.01297)(VALUE) + (-550.8)(AGEREC)	139.8	2.44025	4.33174	0.0378
F16	0.76014	FOSBES = (131.6) + (.00997)(VALUE) + (-1.43)(YEAR)	172.3	1.40569	97.35033	0
F100	0.80497	FOSBES = (-3626.7) + (-.00122)(VALUE) + (47.9)(YEAR)	719.8	2.09424	21.63659	0.0006
F111	0.71086	FOSBES = (-47.7) + (.01619)(VALUE)	163.9	2.48326	15.75142	0.0008
OTHER	0.7046	FOSBES = (-4137.8) + (-.00232)(VALUE) + (15.7)(YEAR)	275.8	2.23188	14.78028	0.0027

Atch 2

ALERT FY90-FY94 POM FORECASTS

$ IN MILLIONS

	FY90	FY91	FY92	FY93	FY94
A007	25.3	25.3	23.1	22.8	23.6
A010	45.2	47.1	46.9	47.5	49.2
B01B	373.7	96.5	99.4	102.0	105.6
B052	153.2	169.1	172.4	186.1	192.7
B111	17.6	18.2	18.6	19.1	19.8
E111	11.9	12.0	12.3	12.7	13.2
F111	154.0	164.2	159.8	160.7	166.4
C005	93.1	84.3	76.9	70.3	72.8
C017	18.9	36.7	63.8	67.8	70.2
C130	132.3	132.7	136.4	141.4	146.4
C135	156.9	167.2	175.1	184.6	191.1
C141	68.4	73.3	74.0	76.7	79.4
E003	29.8	28.5	27.0	25.5	26.4
E004	2.4	2.9	2.9	2.9	3.0
F004	79.8	59.5	56.5	45.2	46.8
F005	21.4	24.6	25.5	25.6	26.5
F015	397.7	428.6	434.7	463.1	479.4
F016	574.1	549.3	598.6	646.8	669.6
H001	1.2	1.4	1.3	1.3	1.4
H003	2.5	2.9	2.9	3.0	3.1
H053	17.2	17.4	17.9	18.5	19.2
H060	.5	.5	.5	.5	.5
OTHR	164.8	204.4	190.9	163.2	168.9
T037	13.7	14.5	14.8	15.2	15.7
T038	43.8	45.2	46.5	47.7	49.4
T039	.8	.9	.9	1.0	1.0
TOTAL	2600.2	2407.0	2479.5	2551.2	2641.2

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2. Rexroad, Adrienne and Larry Collins, ALERT Model Validation HQ AFLC Technical Report, June 1988.

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